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The 48 Acts

PARLIAMENT met on Sunday, September 3, to hear the Declaration of War by the Prime Minister and the promises of support from the various political parties. It then proceeded at breakneck speed, with the minimum of debate, to pass through all their stages bill after bill prepared by the departments against the eventuality of war. No fewer than 19 fresh Acts of Parliament were placed on the Statute Book in the first week, and the total is now forty-eight. In any other country in the world the Premier would have asked for and obtained full powers to govern by decree. The Mother of Parliaments in the Home of Democracy took the better course of giving a first, second and third reading in both Houses to 48 separate enactments, and subjecting each of them to all the usual formalities ending in the Royal Assent.

In this way the power of the local out-of-work whose permission has to be obtained before a tobacconist can obtain a foot of briar out of which to make a pipe, is in fact and form democratic power, derived direct from the people themselves. The business man, whose vital work is now obstructed on every hand, may perhaps feel some comfort by reflecting upon his theoretical freedom. For the rest, he must be content to know that we are engaged in war and that these things happen in war, although in the present case they happen ten times as drastically as in any previous war.

In 1914-18 we had Dora; now we have forty-eight little Doras; and it may be useful to recall the history of the founder of that great trade-destroying family. Dora the First lived for ten long years after the end of hostilities. All that time traders were agitating for repeal and freedom, while bureaucrats—small blame to them—fought strenuously for the retention of the powers they had enjoyed for the purpose of winning the war. That part of the story of Dora must not be repeated. Patriotic traders recognise that while war lasts little can be done, the bureaucrats being in an unassailable position. The powerful attempt to end the scandal of the Ministry of Information has merely resulted in the creation of two departments instead of one. The agitation against the ruthless seizing of hotels makes not the smallest impression upon the regional controller of socks or sausages, whose rise in salary and status is dependent upon the number of clerks he can contrive to put upon his pay-roll. So that we must win the war before anything can be done—which is not to say that our business men must wait until the end of the war before deciding what needs doing.

Having the protracted old age of Dora the First in our minds, it is imperative that the forty-eight little Doras should be buried on the very day that victory is secured. To this end every trade association in the

land should table without delay a demand for the immediate and simultaneous repeal of the forty-eight unread statutes enacted, so wisely and rightly, by Parliament. Such a repeal would, of course, cause a great deal of distress and some confusion. Many thousands of Jills and Jacks in Office would find themselves suddenly out of employment. That is to be regretted, but Parliament must remember that on the fatal Sunday afternoon many hundreds of thousands of self-supporting persons were pitchforked into ruin. They are now walking the streets reading with a tragic mixture of amusement and amazement large placards announcing that Freedom is in jeopardy. The trade, profession or other service out of which they scraped a living has been shut up over night, and their rights as free citizens must be restored to them at the first possible moment.

Thousands of those brave people now serving in the fighting and other forces are displaying, in a way to make us proud, a double heroism. They have to maintain the moral and physical courage to do their war work and also the strength to contemplate, without a grumble, the wreckage of homes and businesses laid low by these forty-eight Acts. Their self-sacrificing service will be performed with added zest if they are assured that on the day when the enemy runs up the white flag, Freedom and Liberty will, in actual fact, come back to them in at least as good measure as they enjoyed on Saturday, September 2.

TWENTY YEARS AGO

A PROBLEM that disturbed the world of science in 1919 was whether the scientists of Germany should be re-admitted to what THE CHEMICAL AGE described in its issue of October 18, 1919, as the "international fold." THE CHEMICAL AGE took a very decided view on the subject as the following extracts from the journal indicate:—

"... The people who practise science are human beings. They are subject to likes and dislikes, and are not wholly indifferent to moral and social considerations... the present advocates of the re-admission of Germany to the fellowship of world science must reckon with this fact. There is no boycott of German science *quâ* science; but there is a very natural difficulty in forgetting the barbarous uses of science which German scientists approved. The obstacle is, in a word, not scientific, but ethical. Such pleas (on behalf of a reconciliation with Germany) are generally listened to with sympathy, but they usually pre-suppose some kind of confession on the part of the persons for whom the intercession is made. That is one of the difficulties here: there has been no disavowal or, indeed, any sign of regret."

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NOTES AND COMMENTS

Future Argentine Trade

TRADERS with foresight will anticipate future conditions by taking note of opportunities that may arise when exchange conditions return to normal. Some indications of opportunities of the kind may be found in the recent *Report on Economic and Commercial Conditions in the Argentine Republic*, issued by the Department of Overseas Trade (H.M. Stationery Office, 3s. 6d.). In the heavy chemical trade a new installation for manufacturing chlorine and caustic soda locally is recorded, but in alkalis United States competition was keen, while imports from Japan showed a decrease during 1938. German and French firms remained actively competitive in dyestuffs. The bulk of the imports of sheep and cattle dips still come from the U.K., and the same may be said of anti-fouling paints, but cellulose enamels and varnishes came mainly from the U.S.A. Price-cutting by German and Belgian manufacturers made inroads on the quantities of lithopone and zinc oxide imported from the U.K., and in the field of other paint materials, such as ferrites, ochres, and oxides, British makers were barely able to hold their own, owing to price difficulties, against the same competitors. Future prospects for water-softening plants and chemicals should be favourable.

American Mineral Census

THE inauguration of monthly canvasses on the production, consumption and stocks of strategic minerals commodities by the United States Bureau of Mines was announced recently by Mr. Harold L. Ickes, Secretary of the Interior. This action was prompted by the need for current accurate data on certain domestic and imported raw materials to assist Government agencies as well as industry in meeting the various problems presented by the interruption to shipping, resulting from the European War. Mr. Ickes stated he had been advised by Dr. John W. Finch, Director of the Bureau of Mines, that manufacturers have on hand fairly large stocks of strategic minerals and that no immediate shortages are anticipated. Nevertheless, the fact-finding programme was deemed imperative at this time because the situation required careful watching in view of the fact that acute shortages of

mineral raw materials would be detrimental to national defence and public welfare. He also pointed out that current data on industrial mineral raw materials would be invaluable to private enterprise and urged the patriotic co-operation of business in this effort of the Bureau of Mines to render a timely and essential service.

Glass Chemistry

THE Department of Glass Technology of the University of Sheffield has just issued the twenty-first volume of its *Experimental Researches and Reports* (1938; 7s. 6d.). While the majority of the papers published deal, as might be expected, with the glass industry in particular, the general industrial chemist will find much of practical value in the carefully-compiled lists of references. Attention may be especially drawn to the references following the reports by Violet Dimbleby, M.Sc., on *Chemical Analysis as Applied to Glasses and Silicates, etc.*, and *The Investigation of Chemical Properties; and the Chemical Testing of Glass*. Actually the year under review yielded few additions to the knowledge of the chemical properties of glasses, but the number of important books and papers dealing with the analysis of glasses and silicates was considerable, and many of them are of very wide application. A list of about a dozen publications dealing with the special branch of gas-analysis is an additional convenience.

Benzol Prices

THE retail price of Pool motor spirit has been increased by 2d. per gallon, as from October 17; but as this charge is due to the increase of freights on imported petrol, the Pool Board has decided that, contrary to the old practice, the price of home-produced spirit (benzol) shall not be increased *pari passu*, as the increase freight factor does not apply in this case. The benzole content of pool spirit will be valued at its pre-advance parity and it would therefore be unfair if the buyer of crude benzol under sliding-scale contracts based on the market price of the refined benzol should have to pay an increased price and continue to receive the original figure for his refined spirit.

Topical Tints

UNDER the title "1940 Spring Woolen Colors," the Textile Color Card Association of the United States, Inc., have released a news item announcing that "despite the European conflict, there is no blackout of color in the advance fashion programme for the coming resort and spring seasons." Some of the fanciful titles of these newest colour-shades have a pleasantly topical air about them which should make a special appeal to some of those more immediately interested in "the European conflict." "Undersea Blue," for example, should be of particular interest to U-boat commanders, while our own naval men, though they have probably had quite enough of "Dawn-green" and "Horizon Mauve," will doubtless turn with relief, not to say delight, to "Southsea Rose," even though the latter is described as being "in the fuchsia gamme." "Dixie Brown" is a colour familiar to all old soldiers, but the B.E.F. would probably find "French Caramel" more to their taste. "Yankee Navy," which we should have expected to be a neutral tint, is described as a "clear, lively tone." The late television staff from Alexandra Palace will appreciate the description of "Wood Green" as a "rich true tone"; but "Pink Jade" is not only "cloudy" but also "high style and very subtle in character" . . . well, what would you expect?

THE DEVELOPMENT OF THE TECHNICAL APPLICATIONS OF HYDROGENATION—II.

Progress in Petrol Production

By

E. F. ARMSTRONG and K. A. WILLIAMS*

(Continued from page 272, THE CHEMICAL AGE, October 14)

IF selective conditions prevail in the treatment of the glycerides of linoleic acid, the first phases of hydrogenation produced the isomers of oleic acid, solid, and resembling in their properties those obtained when starting with oleic acid itself. It has not yet been discovered whether they are of identical composition; it is usually thought otherwise. Nevertheless it has been established that there is a constant proportion between the solid and liquid isomers formed and that this proportion is the same as in the hydrogenation of oleic acid under like conditions, but that it varies only with the nature of the catalysts and with the temperature. If a mixture of linoleic and oleic acids is hydrogenated at 200° C. or more, the linoleic acid reacts in a like manner, *provided that it exceeds in quantity half the oleic acid*. If the quantity present is less, both acids are attacked. This is a very neat example of the theory of "absorption," showing a preferential absorption of linoleic acid when starting with a mixture of the two acids, when an excess of its double bonds is available to cover the surface of the catalyst.

The relation between the proportions in which the oil, the catalyst and the hydrogen are mixed is of great importance. If the catalyst is covered by a relatively thick layer of oil, the hydrogen can reach it only by preliminary solution in the oil and the speed at which this takes place determines the speed of the reaction, provided that this is the slowest stage. If the concentration of oil is brought to a minimum, the speed of absorption and desorption of the oil is also at a minimum since, under such conditions, it will not completely cover the surface of the catalyst and the hydrogen will be freely absorbed. In such conditions it is usually difficult to bring about a rapid desorption of a partially hydrogenated molecule and the whole course of the reaction may be affected—the selectivity being diminished and the isomerisation greatly reduced; as would be expected. All these effects can be found in the normal technical application of hydrogenation by one or more of the processes in use and if a particular effect is required the appropriate method can be chosen.

Objection to Isomers

In the first stage of this technique the use of a synthetic fat as the primary material was criticised, but nutrition experiments on a large scale soon showed that hydrogenated fats could perfectly well be assimilated. Later, when the production of isomers was recognised, soap makers in their turn objected that when using isomers only a poor lather could be obtained. This prejudice has been almost entirely overcome, thanks to the progress made in the technique of soap manufacture, and by the choice of oils giving a smaller proportion of isomers.

The high price of hydrogen has led other experimenters to adopt an opposite point of view and they tried to increase the proportion of the solid isomers produced in the first phase of the reaction, in such a way as to obtain solidification without using more hydrogen than was absolutely necessary.

It is probable that most hydrogenated oil, at least in Europe, is made into food fats; it is, therefore, unnecessary to insist on the purity and cleanliness indispensable to each phase of the operation. Nowadays there is a tendency to make the different industrial operations continuous, although up to now in the glycerine industry batch-working has been practised on a large scale. The refining of fats by alkali and their

continuous deodorisation, continuous reduction of the catalyst, and continuous hydrogenation are all operations which have been covered by more or less successful experiments on a large scale, and it is certain that in a short time an appropriate operating process will be devised.

The technology of catalytic hydrogenation has now reached a point at which the oldest methods have all become more or less standardised from an operating point of view, and it is possible to compare their respective merits.

Work is continuing in the perfecting of new processes, especially continuous processes, and we may hope that the latter will reduce the cost of operation.

Every process can be divided into three stages:

1. Preliminary phase:
 - (a) Production of hydrogen;
 - (b) Refining of the oil;
 - (c) Production of the catalyst;
 - (d) Reduction of the catalyst.
2. Hydrogenation reaction.
3. Complementary operations:
 - (a) Cooling;
 - (b) Separation of the catalyst from the oil;
 - (c) Final refining and deodorisation of the oil.

In the preliminary operations, the production of hydrogen is carried out by one of the methods described above and the refining of the oils follows according to methods that are now well known.

Powdered Nickel Catalysts

In systems using a powdered catalyst, the catalyst is either nickel carbonate supported on kieselguhr or on some other inert body, or nickel formate. To prepare nickel carbonate catalysts the supporting material is usually suspended in a solution of nickel sulphate and a slight excess of sodium carbonate is added. The precipitated catalyst is washed thoroughly to remove all soluble salts, and then dried. It is then reduced in a current of hydrogen at temperatures of 250° C. or more, according to the nature of the support and the required strength or activity. The temperature at which the reduction takes place is important in the establishment of equilibrium between the strength and the activity. The reduced catalyst is then cooled and mixed with oil in which it may be kept till required. To-day we are tending to employ the most robust catalysts rather than the most active, which are most susceptible to poisoning.

The nickel formate catalyst can be used either with a support or alone and it is reduced in situ in the oil to be hydrogenated. In this way the reduction and hydrogenation reactions are combined, leading to a saving in material, in manual labour, and in working expenses. The reduction temperature is about 250° C. There is no danger of deleterious effects of the oil at this temperature. The preparation of powder catalysts, which are also employed in practice, starts with aluminium and nickel alloys, from which the aluminium is removed by solution in alkali.

Massive Nickel Catalysts

In the continuous system, using a massive nickel catalyst, the nickel in the form of plates is contained in "cages," or perhaps used in the form of perforated discs threaded on a shaft. Its surface is prepared before installation in the apparatus, and it is activated from time to time by electro-

* Translated from *Chimie et Industrie*, August, 1939, page 234.

lytic oxidation in an electrolyte consisting of a dilute solution of sodium carbonate. After activation, the catalytic mass is washed thoroughly and then introduced into the reaction tubes in which hydrogenation will occur. It is reduced by means of hydrogen at a lower temperature than that used for other processes and it is then ready for the hydrogenation reaction.

The conduct of the hydrogenation depends always on how the oil, hydrogen, and catalyst are mixed. With systems using a powdered catalyst, this intimate mixture is achieved by vigorous agitation of the three products in an autoclave, or by pulverising the oil-catalyst mixture in a hydrogen atmosphere and by circulating this mixture until the reaction has proceeded to the desired degree. In the continuous system, the catalyst "cages" and the reaction tubes are filled with hydrogen and the oil is circulated on the catalyst. Operations in every system are carried out at temperatures of 140° to 200° C., and with pressures of 2 to 10 atmospheres.

Second Refining

In powder methods the oil is then cooled and the catalyst removed by filtration. It is frequently necessary to refine the oil a second time in order to eliminate the small quantities of free fatty acids formed by decomposition, and it may be necessary to proceed to a final operation to separate traces of nickel which have dissolved in the oil. In the continuous method the oil is in contact with the catalyst and hydrogen only for a short period and final refining is unnecessary. Moreover, the oil leaves the reaction tubes with less than 1 part of nickel to 10,000 of oil, either in solution or mixed, and filtering is superfluous. In all cases where the product is used for food purposes it is deodorised by treatment with steam at a high temperature.

In calculating the financial return of the different processes it is usual to take into account the cost of the production of hydrogen, of the production and reduction of the catalyst, of the hydrogenation, and of the separation of the catalyst. The cost of re-activating the catalyst and the losses of the catalyst must also be taken into account, but costs of refining and deodorisation of the oil are not included.

With such raw materials as cotton-seed oil, ground-nut oil, or whale oil for which 1,000 cu. ft. (28 cu. metres) of hydrogen are required per ton of oil, the powder methods involve working costs of 23s. to 30s. per ton of oil, independently of manual labour, and the continuous methods about 12s. per ton. In large installations, the powder system is certainly less expensive than in smaller installations, but it is necessarily more expensive than the continuous system, since it demands more labour and a much greater ground space; in addition, the number of different operations it involves is much larger.

Laboratory Technique

In the laboratory hydrogenation has been carried out under high pressure as a method of synthetic organic chemistry.* Four catalysts are usually employed: platinum, palladium, nickel, and chromium copper-oxide. The reactions may take place in one of the following three ways:

- (1) The catalyst is passed over a mixture of hydrogen and an organic compound in the vapour state, according to Sabatier, at or about atmospheric pressure. This method has a limited application.
- (2) The process is operated at 1 to 5 atmospheres with a liquid or a solution which is agitated in the presence of the catalyst and of hydrogen. This method is especially useful with colloidal catalysts.
- (3) The process introduced by Ipatieff uses the reaction with hydrogen at a high temperature (250°) and under high pressures (100 to 300 atmospheres). Thanks to improvements made in materials and in the forms of reaction tubes, apparatus

can now be constructed at low cost, easily managed and with every guarantee of safety.

The technique of microhydrogenation has been developed and forms part of the equipment of a modern microchemical laboratory.

Fatty alcohols, such as lauric alcohol or its homologues, are now produced technically on a large scale by catalytic hydrogenation of glycerides or fatty acids under high pressures and at high temperature. The reaction involves the splitting of the esters and the reduction of the carbonyl group into an alcoholic group; this is achieved by means of catalysts of the type indicated above. The reaction products are utilised, after sulphonation, as softening agents, and in this form are used in the preparation of cosmetics, etc.

The economic success of every technical hydrogenation process depends to a large extent on the price of hydrogen. This varies considerably according to the scale on which it is produced and the degree of purity, particularly the absence of sulphur compounds. The hydrogen required for the organic solvents and for hardening of fats must be of the highest quality, free from carbon monoxide; that which is used for the synthesis of hydrocarbons may contain other gases and traces of sulphur. When only small quantities of pure gas are required, the method of electrolysis is most convenient, and to-day it is frequently used by industrial undertakings which hydrogenate fats.

Water-gas Processes

When producing in greater quantities water gas is taken as a starting point, and the three following processes are used:

The *iron-vapour process* consists of the alternate reduction of iron oxide by water gas followed by passage of steam over the iron; iron oxide is generated and free hydrogen liberated.

The reaction $C + H_2O = CO + H_2$ is obtained in two consecutive stages.

By the *liquefaction process*, carbon monoxide is removed from water gas, though not completely, by passage through a Linde liquefaction apparatus; this process, which is less suitable for hardening fats, is very interesting when applied to coke-oven gas, for operations such as hydrogenation of mineral oil or coal, where the gaseous impurities are of no importance.

In the *catalyst process*, blue water gas and steam are passed over a catalyst of iron oxide coupled with other substances acting as promoters: it is used in very large units. The resulting gas is compressed, as a rule in two stages, carbon dioxide is removed by washing with water at lower pressure, whilst carbon monoxide is eliminated at a higher pressure in washers containing ammoniacal copper salts. With proper mixing of air, a final mixture may be prepared with exactly the right proportions of nitrogen and hydrogen to be used for direct synthesis of ammonia. Hydrogen to be used for hydrogenating coal is also prepared by this process. In places where gaseous hydrocarbons are cheap and abundant they provide another raw material for the manufacture of hydrogen.

The *methane steam catalyst process* is worked at a high temperature (1,000° C.) in presence of nickel-aluminium catalysts. This method has been developed on a large scale in America, where natural gas is plentiful, and also in Germany, where cracking gas obtained from the hydrogenation of coal is used. This hydrogen is also used for the hydrogenation of mineral oil and coal.

The *pyrolysis process* makes use of the fact that hydrocarbons decompose at a high temperature into black smoke and hydrogen.

Much research work is being carried out to find the cheapest possible means of producing hydrogen, particularly in connection with such questions as complete gasification of coal in presence of hydrogen. It is difficult to give figures for the cost of each specific case since such figures depend to a large extent on the size of the plant, and on local conditions affect-

* See HOMER ADKINS, *Reactions of Hydrogen with Organic Compounds over Copper Chromium Oxide and Nickel Catalysts* (University of Wisconsin Press). See also CARLTON ELLIS, *Hydrogenation of Organic Substances* (Van Nostrand Co., New York, 1930).

ing primary materials, price of power, outlets for by-products, and above all general expenses.

The following table gives some idea of relative possibilities:

Process	ORDER OF SIZE		
	Pence per 1,000 cu. ft.	Pence per lb.	Pence per cu. m.
Steam-iron	15-40	2.9-7.6	0.43-1.14
Catalysts and water gas	10-20	1.9-3.8	0.28-1.57
Pyrolysis of hydrocarbons. Liquefaction of coke-oven gas	9-12	1.7-2.3	0.26-0.34

The price of electrolytic hydrogen depends on the price of electricity. When this price is very low, and favourable prices are obtainable for oxygen, this process may cost much the same as the others.

It must be noted that although prices in comparison with other gases seem satisfactory when they are measured in cubic ft., the price per unit in weight is still high when compared with the sale of the product obtained: 10 pence per 1,000 cu. ft. is equal to £17 10s. per ton.

In recent years the questions of hydrogenating coal oil, that is to say, gas tar or low-temperature tar, or coal itself and derivatives of petroleum has been much discussed; the essential facts of the question can be found in several publications and we need say no more on this subject here. Positive results, technical as much as economic, which have been obtained, technical difficulties and their solution, are still kept secret, together with many other details which the technician would like to know.

Synthetic Petrol Production

These processes are worked on the largest scale; they test the ingenuity of the chemist to the utmost; they produce large quantities of petrol and finally supply in part the needs of places which have no natural petroleum of their own. The price of the yield of this synthetic petrol far exceeds that of the imported product; moreover, such processes can be worked only with the help of an official subsidy in one form or another. They are made necessary by the tendency towards self-sufficiency due to the present troubled state of the world.

The importance of the coal-oil question has attracted attention to other methods which might lead to the required end. The most promising of these is the "synthetic" method, with which the name of Fischer is often associated; in England this method is being independently studied by Dr. Myddleton and by Messrs. Synthetic Oils, Ltd. It is based on the reactions of condensation and hydrogenation and the study of this problem is bringing highly interesting complex reactions to light. The starting point in this process is water gas or a similar industrial gas which can be prepared in large quantities at a low price. Such gases contain approximately equal proportions of carbon monoxide and hydrogen, when the theoretical reaction is expressed by the equation $\text{CO} + 2\text{H}_2 = \text{H}_2\text{O} + \text{CH}_4$.

In the Fischer process, crude gases must be enriched with hydrogen or by some process such as the Lurgi process, which was in part devised with this object in view. In the Lurgi generator, the gasification of coke at a low temperature under a pressure of 8.5 kg./sq.cm., in a current of oxygen and steam, produces a gas which has the following composition after washing with water under pressure to remove carbon dioxide.

CO_2	1.0 per cent.
CO	30.7 per cent.
H_2	61.6 per cent.
CH_4	4.6 per cent.
N_2	2.1 per cent.

In this gas 92 per cent. comprises synthesis gas in the required proportion and it is obtained cheaply.

English experimenters are satisfied with a proportion of 1:1, and claim that the use of carbon monoxide in excess of that required by theory, leads to the formation of an oil with a higher octane number, and containing a much greater proportion of unsaturated hydrocarbons. The primary reaction

is the polymerisation of the radical CH_2 into a mixture of mono-olefines. It is achieved with the help of cobalt or nickel catalysts; nickel catalysts are by far the least expensive. Nickel is a better promoter of hydrogenation than cobalt. The secondary reaction is a hydrogenation reaction and if this is allowed to proceed too far, a mixture of saturated hydrocarbons will result, extending, as regards the length of the chain, from propane gas up to waxes; this mixture would have a commercial value less than that of a mixture either partially or completely unsaturated, and would contain propylene and its homologues.

Cobalt-thorium Catalyst

Synthetic Oils, Ltd., have used a strong catalyst of cobalt-thorium, which will allow of a small proportion of organic sulphur to be contained in the reaction gases. This modification has two advantages, one economic, in that a saving is effected in eliminating the sulphur contained in the gas, and the other technical, in the sense that the traces of sulphur combine with the catalyst and finally act in the direction of reducing its hydrogenating capacity.

The German and English processes have much in common with each other; their evolution is followed closely by experts, especially from the point of view of the nature of the products and the cost of the yield.

A problem that has long held the attention of the gas industry, is how to get the maximum out of a ton of coal; for example, to obtain more than is obtained by carbonisation at a high temperature, in the form of gas of a high calorific value and of coke. If the coke is also gasified a poor gas results, which it is not economical to distribute and which necessitates the addition of methane.

The synthesis of methane when starting from carbon monoxide and hydrogen has been described by Sabatier for the first time. He studied the reaction $\text{CO} + 3\text{H}_2 = \text{CH}_4 + \text{H}_2\text{O}$, at about 300° C., but he encountered numerous practical difficulties. A few years later, Armstrong and Hilditch showed that when purified water-gas is passed alone over nickel at about 205°, a considerable change occurs, according to the reaction: $2\text{CO} + 2\text{H}_2 = \text{CO}_2 + \text{CH}_4$.

In such a process, it has been found in practice that the thermal advantages of enriched gas are not enough to cover the cost of eliminating the carbon dioxide. Catalysts were very sensitive to sulphur poisoning, and exothermic reactions were responsible for a considerable loss of heat. The first step forward was achieved when the reaction was conducted under pressure, when Lurgi found that the heaviest molecules, methane and carbon dioxide, tended to form.

When lignite is carbonised in a current of steam and oxygen under a pressure of 20 atmospheres, a gas of relatively high calorific value (450 B.T.U. per cu. ft.) is obtained, due to synthesis of methane in the generator. In the bottom of the generator the fuel is gasified by combination with oxygen and steam, and at the top the gas is enriched by synthesis of methane, derived from carbon monoxide.

The Lurgi Generator

Other extremely important experiments, which the Lurgi Company has made known, have shown that if their generator operated under modified conditions, with a larger proportion of steam and more rapid gasification than that used when a gas of high calorific value is required, after carbon dioxide has been removed the gas produced contains at least 80 per cent. of hydrogen, which, moreover, will be at whatever pressure is required for the working of the generator. The practical advantages of this method are obvious: not only can carbon dioxide be separated by water-washing at very little expense, but the expense of compressing the hydrogen is greatly reduced, so that the cost of this process is probably less than that of those previously described.

About the same time the Joint Research Committee of the Institution of Gas Engineers discovered that if hydrogen under pressure was passed over low-temperature coke, while the temperature of the latter is raised from 550° to 800° C.,

a very large quantity of methane is obtained by direct hydrogenation of the coal while it is decomposing, the coal substance being gasified before it has been made un-reactive by overheating during carbonisation. The simplicity of this reaction is a highly important discovery, but to be profitable a cheap method of obtaining hydrogen at a pressure of several atmospheres is essential; and the Lurgi process described above seems to offer great hopes of providing these conditions.

The new process has passed the laboratory stage; it is now the object of experiments on a larger scale. To describe it, it would be difficult to improve on the words of Mr. E. V. Evans, its promoter:

"One pictures coal being charged into a vessel where it will be treated with hydrogen under pressure in such a manner that it will produce as much rich gas as is desired, together with a considerable quantity of a primary tar. Probably half the weight of coal will disappear in this operation. The other half will be fed to a producer operating under pressure and supplied with oxygen and steam, and in this vessel it will be gasified to produce the hydrogen required for the first operation. This hydrogen will leave the generator with a considerable quantity of undecomposed steam and with an equal volume of carbon dioxide. Most of the heat from the hot gases and from the undecomposed steam can be recovered and returned to the generator as heat in the incoming steam and oxygen.

"There is no reason to doubt that a thermal efficiency of something like 80 per cent. should be achieved in this part of the process, that being the efficiency found from the commercial working of a Lurgi generator without a heat interchanger, operating to produce rich gas. The rate of gasification in such a producer will probably be of the order of ten times the usual rate of gasifying coke in a producer at atmospheric pressure. The hydrogen, after removal of the carbon dioxide, would pass to the methanation process, and it is of interest to note that the rate at which gas can be produced per cu. ft. of reaction space by gasifying semi-coke in hydrogen under pressure is between ten and twenty times the rate at which the same thermal quantity of gas is obtained by carbonisation at high temperature. The formation of methane by the direct combination of carbon and hydrogen is an exothermic reaction, some 8 to 9 per cent. of the potential heat of the reactants being liberated. It is expected that this heat will be sufficient to make this stage of the process thermally self-supporting and it should be possible to obtain a thermal efficiency here approaching 90 per cent."

Technical dreams do not always come true, and such figures must be accepted with great reserve; but if there is at least a possibility of producing 210 therms of gas and tar from 300 therms contained in the coal, instead of some 100 therms as at present, it seems well worth while to meditate a little and to spend some money in the further study of this problem.

THE MELCHETT LECTURE

Progress and Development of the Supply of Explosives

THE Melchett Lecture for 1939 was presented to the members of the Institute of Fuel on Thursday, October 19, by Mr. H. A. Humphrey. His subject was "The Supply of Explosives during the War and the Early History of Billingham." The Institute having already published an account of the author's technical work in the field of Fuel Technology (J.I.F., Aug., 1939), he was left free to deal with his administrative activities in that field.

The subject chosen deals with a very perfect kind of fuel which burns more rapidly than pulverised coal and may leave no ash or produce any smoke. It is the fuel of that highly developed one-stroke cycle internal-combustion engine known as the modern gun. The choice is justified because the subject has interest, significance and importance for to-day and for the future.

Mr. Humphrey began his lecture by detailing the origin and history of the Department of Explosives Supply, of which Lord Moulton was the head, and of which the lecturer was appointed Assistant Director, and technical adviser for the two sections relating to the purification of trinitrotoluene and to the production of ammonium nitrate.

"Crude T.N.T.," Mr. Humphrey went on to say, "was being imported from America and was also being made at several works in England and Scotland. Later, a large factory was erected in Scotland for greatly increasing the output. The crude T.N.T. from different sources differed in crystalline structure, in melting-point and in impurities. The necessity for bringing it all up to a standard specification was most pressing, and it happened to be the first task that Lord Moulton asked me to undertake. Investigation showed that the pre-war purification plant having the greatest output and yielding the most pure material, was using benzol in the process, and the extreme care needed to operate such a process without accidents rendered it useless as a war time proposition when only rough unskilled labour was available; moreover, the time for purification was 3½ days."

The author enlisted the willing help of Messrs. Brunner Mond and Co., and they lent him the services of Captain (later Major) F. A. Freeth and Mr. L. A. Munro to work out a more suitable process. Success was soon achieved, and

the next problem was the necessity for extending the operation of the process on a large scale. Messrs. Brunner Mond and Co. agreed to convert their soda crystal plant at Silvertown into a crude T.N.T. purification plant. Continued researches on the part of Brunner Mond and Co. brought about a still better process and it became again essential to seek their co-operation towards providing designs and staff for erecting and operating a central purification plant to which the crude T.N.T. from all producing works could be sent for purification. It was deemed essential that this plant should be as free from combustible material as possible, and it was, therefore, constructed in steel and concrete, and for safety it was spread out along a frontage of a quarter of a mile. The first unit started output in February, 1916. It was most unfortunate that a fire which started in the roof of one of the sheds at Silvertown caused an explosion which completely destroyed the works, caused loss of life and wrecked much surrounding property. It was subsequently proved that the fire was due to the formation of a little-known self-igniting chemical compound formed as dust under the roof.

Mr. Humphrey next dealt with the production of ammonium nitrate, the demands for which grew so rapidly and reached such huge proportions that it was a continuous and arduous struggle to keep pace with the needs.

The peace time production before 1914 was only 30 tons per month, an amount utterly inadequate to meet the increasing demand for high explosives, and new sources of supply had to be discovered. Some 1,000 tons per month of 70 per cent. calcium nitrate could be obtained from Norway, and it was decided to import this material and convert it to ammonium nitrate. Messrs. Brunner Mond and Co. again agreed to devise a suitable process and to undertake the conversion. They had patented a process for the manufacture of ammonium nitrate along lines similar to their ammonia soda process. It consisted in ammoniating a strong solution of sodium nitrate, blowing CO₂ gas through this to obtain bicarbonate of soda as a precipitate, and ammonium nitrate in solution. The solution after separation was to be cooled to deposit solid ammonium nitrate.

In the meantime the difficulty of obtaining enough am-

monia presented a serious problem, and a conference was called in London with reference to the purchase of sulphate of ammonia and of ammonia liquor, with the result that Messrs. B. M. and Co. were appointed agents to purchase ammonia liquor and to supervise the erection of a number of plants at gas works and coke ovens, etc., where ammonia could be concentrated to 25 per cent. solution for transport to B. M. and Co.'s works.

Sodium nitrate could be imported from Chile, but it was too impure for use, and B. M. and Co. suggested that the Salt Union were well adapted to undertake the purification. The Salt Union did some fine work in designing and erecting a suitable mechanical washing plant for raw sodium nitrate, and they kept on adding new units until their capacity reached 1,500 tons output per week; but the difficulties in the ammonia soda process were not yet solved, and B. M. and Co. had reluctantly to report to Lord Moulton that the large output aimed at could not be reached.

Ammonium Nitrate Process

In the midst of great anxiety his department received an offer from the Ammonia Soda Co. to manufacture calcium nitrate, and then convert it to ammonium nitrate. Trials had been made on the scale of 1 ton per week. After careful investigation a contract was entered into for the manufacture of 150 tons per week. Early in 1916 it became possible for B. M. and Co. to acquire a controlling interest in the Ammonia Soda Co., and this enabled their own chemists to set to work to improve the process. Originally double crystallisation of the calcium nitrate was necessary, but under the improved process only one crystallisation was needed.

At about the same time review of the whole position of ammonium nitrate made it quite clear that a radical change in the programme of manufacture would be necessary, and, thanks largely to the indomitable energy of Captain Freeth, the ammonia soda process made great developments, backed by Mr. Humphrey's repeated insistence that the plant should be altered and enlarged. By May, 1916, B. M. and Co. reached a production of 80 tons a day. Later on, two of their chemists, Captain Freeth and H. E. Cocksedge, patented a process for making ammonium nitrate from sodium nitrate and ammonium sulphate. New works for operating this process were erected at Swindon; from the start of production in September, 1917, to the cessation of hostilities in November, 1918, they produced 23,000 tons of ammonium nitrate.

Still another valuable effort by B. M. and Co. must be recorded, for they entered the field of producing synthetic phenol for the manufacture of picric acid under the very able direction of Mr. A. W. Tangye. It was a complicated process, starting with benzol and involving the use of concentrated oil of vitriol, calcium oxide, sodium carbonate, caustic soda and carbonic acid. Mr. Tangye worked out the flow sheet, designed the plant and ran it with success.

Fight for Billingham Scheme

Mr. Humphrey next summed up the paramount services of Brunner Mond and Co. to the nation, and read out a letter from Lord Moulton to Mr. Roscoe Brunner, chairman of the company at the end of the war, putting on record the gratitude of his department for these services.

The second half of the lecture, Mr. Humphrey stated, might well be described as "The Fight for the Billingham Scheme"—a fight that was nearly lost, but which ended in the provision of a national asset placing the country in a much better position as regards explosives supply. The story began with the transfer of Mr. Humphrey to the post of chief engineer of the Munitions Inventions Department in August, 1917, and the decision to erect at Billingham a plant for producing synthetic ammonia by the Haber process. Shortage of funds held up the work, however, and when the war ended no technical plant had been erected. Throughout the first half of 1919 discussion revolved around the question whether the Billingham scheme should be proceeded with or not; and it was not until July in that year that Brunner Mond and Co.

decided to adopt it. But once the scheme was in hand, the company gave Mr. Humphrey *carte blanche* to select the very best staff obtainable. He gathered round him a brilliant band of highly trained men, to whom much of the great success which was achieved was due. Captain A. H. Cowap



Mr. H. A. Humphrey.

was chief engineer, and Colonel Pollitt, D.S.O., was a splendid leader, who had the spirit and inspiration needed for such a great undertaking, and who later received the Society of Chemical Industries' medal for his important work.

How essential the Billingham scheme was to the vital enterprises of the country may be seen in the words of the lecturer's original report on the scheme, in which he wrote "Expensive methods of making ammonium nitrate depending on imports of Chile nitrate, were adopted during the war, and, as a matter of National insurance, this country must be in a position to produce its war requirements of ammonium nitrate without relying upon imported materials. Germany could not have conducted the war had she not attained such a position." He had himself invented and patented a new process for the manufacture of nitric acid, and this patent was transferred as a secret process to the Secretary of State for War, who had it patented in foreign countries. He was still engaged on this and other work when the Armistice was signed.

Mr. Humphrey's words on the very near approach of the Billingham scheme to failure are particularly significant to-day:

"I shudder to think what our position in another war would have been without the synthetic ammonia plants we now possess. If we had had to start again to improvise all possible means and methods of manufacturing explosives, as we did in the last war, the delay and inadequate results would be a catastrophe of the first magnitude. Fortunately we are now vastly better prepared."

LIGHT METALS IN EXPLOSIVES

Ch. Baron, in a communication to the Académie des Sciences, says the incorporation in blasting explosives of aluminium or magnesium reduces the volume of gas evolved, but raises the temperature of the reaction to 4,480° C. and gives increased power for use in rock. The metal should be used in a powdered form and, in order to protect it from the slow action of the nitrates, petroleum pitch should be added. Aptitude to detonation is obtained by embodying sensitive nitrogen derivatives like nitroglycerine. Two formulae are given as follows:—Nitroglycerine, 5.0 to 22.0 per cent.; nitro cotton, 0.0 to 0.75; dinitrotoluene, 5.0 to 3.0; petroleum pitch, 1.5 to 2.0; aluminium powder, 5.0 to 2.0; wood meal, 1.5 to 1.25 ammonium nitrate, 82.0 to 69.0.

PERSONAL NOTES

MR. A. T. SISSONS, dean of the College of Pharmacy, Melbourne, was elected to the fellowship of the Australian Chemical Institute at the last meeting of its council.

DR. T. THORVALDSON, F.C.I.C., Professor of Chemistry at Saskatchewan University, Canada, has been decorated with the Order of the Falcon by the Government of Iceland in recognition of his chemical achievements.

MR. J. J. DALE, of the Melbourne University, has been awarded the Australasian Institute of Mining and Metallurgy prize for 1938 for the best paper on a mining or metallurgical subject submitted by a student in Victoria. Mr. Dale's paper was on "Milling Practice at Electrolytic Zinc Works, Rosebery (T.)."

DR. LEOPOLDO PARODI-DELFINO, head of the Societa Bombrini Parodi-Delfino, has had the honour of Senator conferred upon him by the King of Italy. It is understood that the Societa Bombrini Parodi-Delfino is one of Italy's largest explosive works and it is claimed that it possesses the most modern T.N.T. plant in the world.

SIR ROBERT WADDINGTON, chairman of the Dyestuffs Advisory Licensing Committee and of the Dyestuffs Development Committee, has been appointed Controller of Dyestuffs in connection with the order which has been made prohibiting the sale or supply of imported dyestuffs and intermediates except under authority of a licence. Sir Robert was formerly M.P. for the Rossendale Division of Lancashire.

OBITUARY

MR. JOSEPH GIBSON FARQUHARSON, sole partner in the business of Walker and Thomson, oil merchants, West Dock Street, Dundee, died last week. He succeeded his father as Vice-Consul for the Netherlands at Dundee.

MR. WILLIAM MARTIN, senior partner of Messrs. W. and J. Martin, tanners and hide merchants, Glasgow, died last week at the age of 82. With his brother, Mr. James F. Martin, he founded the business in 1883, and maintained his association with it till his death.

MR. THOMAS MCKENNA, general secretary of the National Union of Blastfurnacemen, Ore Miners, Coke Workers and Kindred Trades since 1921, died last week, aged 63. Mr. McKenna became secretary in 1930 of the British section of the International Metal Workers' Federation. In 1934 he was awarded the O.B.E. During the whole of Mr. McKenna's career, it is stated, not a single furnace was closed in the Cleveland area owing to labour disputes or strike action.

THE CHEMICAL AGE regrets to have to record the death on Tuesday, at the age of 69, of PROFESSOR SIR WILLIAM JACKSON POPE, F.R.S., Professor of Chemistry in the University of Cambridge since 1908.

Sir William Pope was elected president of the Chemical Society in 1917, and of the Society of Chemical Industry in 1921. In 1919 he became the first chairman of the Federal Council for Chemistry and three years later became president of the International Union for Pure and Applied Chemistry. An equally high testimony to his ability was shown in his appointment as president of the Solvay Chemical Conferences in Brussels for ten years from 1922. Pope entered the chemical department of the Finsbury Technical College on its establishment by the "City and Guilds' Institute for the Advancement of Technical Education" as one of the earliest students of Professor Armstrong. In 1897 he was appointed head of the Chemistry Department of the Goldsmiths' Institute at New Cross, but continued to act as instructor in crystallography at the Central Technical College, in continuation of the work begun there by Sir Henry Miers. In 1901 he was

appointed Professor of Chemistry and Head of the Chemistry Department at the Municipal School of Technology, Manchester, where he remained for seven years. In 1908 he was elected to the Chair of Chemistry at Cambridge in succession to Professor Liveing. When gas warfare became of paramount importance during the last war Pope developed a process for the direct synthesis of "mustard gas," and finally persuaded the responsible authorities to scrap the cumbrous



The late Sir William J. Pope, F.R.S.

method which even in Germany provided only inadequate supplies of this all-powerful weapon of offence and defence. For this service he was made K.B.E. in 1919.

Pope's fame will chiefly rest on his work on molecular dissymetry. Pasteur in 1849 had laid the foundations of stereochemistry on such a firm basis that the applications of this theory by Le Bel and van't Hoff in 1874 were almost inevitable as an accurate knowledge of molecular structure became available. All the optically-active compounds studied by Pasteur and his successors, however, were of a single type, containing one or more asymmetric carbon atoms, until Pope in 1899 opened the floodgates of new discovery by preparing an optically-active compound in which this property was caused by an asymmetric atom of nitrogen. Pope himself, in collaboration with Peachey and Neville, added sulphur, selenium, and tin to the list of optically active elements, and at a later date optically-active compounds of arsenic, beryllium, copper, and zinc were prepared in Pope's laboratory at Cambridge by W. H. Mills.

Professor Pope was awarded the Longstaff Medal of the Chemical Society in 1903, the Davy Medal of the Royal Society in 1914, and the Dumas Medal of the Société de Chimie Industrielle in 1921. The Society of Chemical Industry awarded him the Messel Medal in 1932.

MR. REGINALD CRAVEN, lecturer in chemistry at the Robert Gordon's Technical College, Aberdeen, has left estate valued at £2,710.

A NEW synthetic fibre made from coal, lime and acetylene gas by a special chemical process has been discovered by a Korean research doctor, it is announced in Tokyo. The fibre is stated to be "as elastic as wool and four times as strong." It can be easily dyed and weaving machines handling viscose rayon can use it.

General News

ON AND AFTER Monday, October 23, the offices of THE CHEMICAL AGE, Bouverie House, Fleet Street, London, E.C.4, will be open for business between the hours of 9.0 a.m. and 5.0 p.m. on the first five days of the week. The offices will continue to be closed on Saturdays in accordance with the principle of the Five Day Week introduced by the proprietors in 1918.

THE BOARD OF TRADE Index Number for Chemicals and Oils for September is 93.8 (100 = average for 1930). This figure, though .3 to 1.3 higher than that for any of the previous months this year, is exactly the same as the corresponding figure for September, 1938, and actually .2 lower than that for October last.

THE JOINT ADVISORY COMMITTEE of the Manchester Chemical Societies will not publish a calendar of meetings this session. It has been decided to suspend, until further notice, the Manchester section's ordinary meetings.

IMPROVED FACILITIES for the study of problems in the control and treatment of diseases of dairy cattle are being provided at the Hannah Dairy Research Institute, Ayr, according to the annual report which has just been issued.

MANY FARMERS in the neighbourhood attended a demonstration at Little Court, Aveton Gifford, South Devon, last week by Mr. B. J. Haines, of Imperial Chemical Industries, Ltd., of the making of molasses silage from grass. An exhaustive explanation of the method used was given by the demonstrator, who emphasised the simplicity and inexpensiveness of the treatment and the high feeding quality of the silage.

A MODEL of a woad mill at Parson Drove, Lancashire, together with a model of a Skirbeck woad cart, has been presented to the Science Museum, South Kensington, by Mr. C. L. R. Adrian-Vallance. At Algarkirk and Skirbeck, between Boston and Spalding, dyer's woad (*Isatis tinctoria*) was last grown in England, and an old mill for grinding woad, which was working as recently as 1932, may still be seen at Skirbeck.

THE ASSOCIATE-MEMBERSHIP examination of the Institution of Chemical Engineers for 1940 will be held at the normal time and on the usual lines, as follows: Home Paper: Mid January to April 1; London Papers: May 2, 3 and 4. The closing date for entries will be Wednesday, December 20, 1939. Copies of past examination papers may be obtained from the offices of the Institution at the price of 1s. per set. Papers are available back to the first examination, held in 1936.

THE SUGGESTION that a body on the lines of a Ministry for the Co-ordination and Organisation of Science should be set up was made at the annual meeting of the Aberdeen branch of the Association of Scientific Workers, which was held last week. Its purpose, it was stated, would be to maintain the efficiency of scientific work and to meet the situation being caused by the interruption of research work which is occurring in some places.

THE NEWCASTLE AND GATESHEAD GAS Co. has completed plans for the substitution of gas for petrol for driving motor vehicles and there are hopes that garage owners and petrol filling stations in the area will take part in the scheme. Mr. J. E. White, Chief Technical Officer to the company, explained last week that an ordinary bus belonging to the Northern General Transport Co. had been operating six days a week for the past year on the Newcastle-Blaydon route burning gas instead of petrol and had given full satisfaction. The company could sell gas to garage concerns which would yield the garage a fair return. The figure they had in mind was about 1s. 3d. per 300 cu. ft.

ALTHOUGH the outbreak of war completely disorganised part-time technical education in vulnerable areas, many polytechnics have reopened, or are about to do so, although in some cases the courses have had to be curtailed. In a number of cases courses of an advanced post-graduate nature have been cancelled, but the Sir John Cass Technical Institute wish, if possible, to arrange day and evening courses in electrical methods of chemical analysis, microchemical analysis, spectroscopy and bacteriology. Those wishing to take classes in these subjects should write, stating possible days and hours of attendance, to Dr. E. de Barry Barnett, Sir John Cass Technical Institute, Jewry Street, E.C.3.

From Week to Week

BARRET, LTD., distillation, rectification and chemical plant manufacturers, are carrying on business as usual at 14 Palmer Street, E.W.1, and inform prospective clients that they will have at their disposal enough raw materials and specialised labour to satisfy contracts which may be entrusted to them for plants relating directly or indirectly to work of national importance.

INTERNATIONAL COMBUSTION, LTD., report the following orders recently received in their grinding, screening, and filtering division. Domestic orders include a 3-roller baby Raymond mill complete, for chemicals; a No. 0 Raymond pulveriser complete with exhauster, cyclone, piping, and dust collector, to grind chemicals; and a 2 in. Vaseal pump to deliver fine suspension of calcium sulphate and finely ground chalk. Among orders from abroad may be mentioned an L.M.10 Lopuleo mill complete for grinding phosphate.

OWING to a shortage of water, the Caldererux Mill, Airdrie, belonging to Robert Craig and Sons, Ltd., paper manufacturers, has had to be closed down, and 600 workpeople have been thrown out of employment. The source of supply is the Hill-end Reservoir, but at present the level of water in the reservoir is lower than it has been in living memory. Engineers are at present engaged in searching for an alternative supply from underground sources, but a resumption of work on a normal scale is not likely until the water in the reservoir has risen substantially.

THE LONDON SHELLAC RESEARCH BUREAU, India House, Aldwych, London, W.C.2, has produced a leaflet (Technical Paper No. 18) on Fibrous Lac, by R. Bhattacharya, M.Sc., Ph.D., F.I.C., and G. D. Heath, B.Sc., A.I.C. A process for treating lac is therein described which produces a resin possessing a characteristic fibrous form. This consists of gelation of ammoniacal solution of lac by formaldehyde. The gel, on washing with hot water, gives an insoluble and a soluble fraction, which are similar to hard and soft lac resins. The insoluble resin has rapid "heat curing" property, and gives solutions having higher viscosity than those obtained from ordinary lac or hard lac resins of corresponding concentrations.

EDINBURGH CORPORATION Gas Department are "looking into" the possibility of providing gas as a substitute for oil fuel for the running of vehicles. Already, since the outbreak of war, transport vehicles in big English centres, including Leeds, Bradford, and Keighley, have been converted to run on coal gas. An official of Edinburgh Gas Department stated on Monday that they could give a supply of gas and were satisfied that the idea was practicable. He stated that one or two transport firms were considering gas as an alternative to oil, while several garage owners had been anxious to know whether it was possible to use gas as a substitute for petrol in private cars. If the inquiries multiplied the Department would provide facilities for filling gas containers. As gas for vehicles did not come under any rationing scheme, users would get as much as they required.

THE FIRST GENERAL MEETING of the newly-formed Organic Fertilisers Association took place recently at 16 Mark Lane, London, E.C.3. The meeting was well attended by representatives of the trade generally, who, after being informed of the Association's objects, wholeheartedly supported its formation. In view of existing measures of Government control covering other more prominent and currently known fertilisers, the need for co-operation, during the time of emergency, among those interested in organic fertilisers, inspired the taking of the initial steps towards the establishment of the Association. A notice of its formation is being sent to H.M. Ministry of Supply and it should be emphasised that members have already expressed their determination, if called upon, to give the utmost support to the Government in the drawing up and administration of schemes covering the distribution of the products concerned. Membership is open to British manufacturers of organic fertilisers and British firms domiciled in the U.K. interested in the importation and wholesale distribution of such products. The entrance fee is £2 2s. 0d. and the annual subscription, £2 2s. 0d. The next general meeting will be held on November 7 and those desiring to become members should approach the hon. secretary pro. tem.: Mr. R. W. Pearson, 16 Mark Lane, London, E.C.3.

FORTY APPLICANTS for the Chair of Chemistry in the University of Aberdeen, to be vacated next year by Professor Alexander Findlay, are being considered by the University Court.

THE QUOTA OF IMPORTS of superphosphate, ground mineral phosphates, and compound manures into Eire during the period November 1, 1939, to October 31, 1940, has been fixed at 18,000 tons.

ABOUT 15,000 CHEMICAL WORKERS' WAGES are to be increased by an agreement reached by the Transport and General Workers' Union and the National Union of General and Municipal Workers with the employers. Their standard rates after next January will become 1s. 4½d. per hour for shift workers and 1s. 3d. per hour for labourers.

THE SHIPMENTS of china clay and china stone for September have shown a fair activity in the Cornish industry during a very critical period. The port of Fowey was responsible for 44,506 tons, compared with 54,426 tons in September, 1938, and 60,506 tons in September, 1937. Both Par and Charleston ports showed less shipping, but the volume sent by rail revealed an increase of over 4,000 tons. The total shipments were 63,245 tons, against 76,238 tons in September, 1938, and 85,249 tons in September, 1937.

Foreign News

NEW ZEALAND'S exports of casein during 1938 declined from 77,534 cwt., valued at £247,782, to 41,403 cwt., valued at £98,030.

THE MANUFACTURE of unbreakable watch glasses from artificial resin, has been started by a Danish engineer. It is reported that the present output is approximately 1,000 glasses per day.

TORONTO gas undertaking is using tetrahydronaphthalene for preventing naphthalene crystallisation of pipe-lines, etc., according to a recent issue of the *C.I.L. Oval*. The material (hydrogenated) is sprayed into the coal gas.

PLANS for manufacturing liquid sulphur dioxide in the United Provinces, India, have been officially approved, and demonstrations are being given at the Imperial Institute of Sugar Technology, Cawnpore, of its use in sugar manufacture.

EXPORTS of calcium chloride from Germany fell from 37,527 metric tons in 1937 to 29,353 metric tons in 1938. For the first five months of this year calcium chloride exports were only 3,067 metric tons, of which Sweden took 1,577, Norway 666, and Finland 14.

IMPORTS OF GUMS and resins into Greece during the first five months of 1939 rose 24 per cent. over the imports for the same period of 1938. The chief source of these products was the Anglo-Egyptian Sudan (55 per cent.), followed by India (21 per cent.).

IN VIEW of the present international situation, the Svovlsyrefabriken Linfjorden, near Norresundby, Jutland, Denmark, has decided to erect a large store occupying an area of five thousand square metres for the storage of its production of superphosphate and sulphuric acid.

MORE THAN FIFTY YEARS after his death, the inventor of medicine tablets has been honoured by the French Pharmacy Society. Stanislas Limousin died at Ardenes in 1887, and a wall plate now marks the house there in which he passed away. A great friend of Pasteur, he also invented hypodermic phials and oxygen tubes, discoveries which have been greatly developed since his day.

THE HOLY LAND is now able, thanks to the many refugee chemists who have taken shelter there, to make its own defence preparations. Ointment for the victims of blister gases, in the event of gas warfare over Palestine, is to be made in that country very shortly. Another local manufacture is a pump for spraying incendiary bombs. Various locally-made chemicals are on view at a mobile A.R.P. exhibition being held in the chief towns.

A BUTANOL PLANT, erected by the Formosan Development Company early this year, is expected to commence commercial production shortly with a capacity of 250 metric tons per month. Butanol production schemes are being undertaken by other leading chemical concerns in Japan, including the Japan Nitrogen Company, Synthetic Chemical Company, Toyo High Pressure Company, Shova Synthetic Chemical Tekkosha, Ltd., and the Dai Hippon Celluloid Company. Self-sufficiency in butanol is anticipated when these production schemes are completed.

PRODUCTION of oil from shale is expected to commence at Glen Davis, near Lithgow, New South Wales, Australia, this month.

MANUFACTURE of cadmium colours and of inorganic and organic cadmium salts has been begun by the Milan firm of Rizzini Ettore e Venceslao.

ETHYL HEXYL CELLULOSE, prepared by N. N. Iznairskaja (*J. Prikl. Khim.*, 1939, 7, 1057), is distinguished by a high degree of insolubility in water.

THE SWEDISH fertiliser manufacturing concern, Stockholms Superfosfat Fabriks Aktiebolag, which is erecting a new lime nitrate factory at Stockvik, near Sundsvall, has increased its capital from nine to twelve million kroner in order to finance the erection of the new plant.

ACCORDING TO A REPORT from the American Consulate at Belgrade, the Yugoslav Ministry of Commerce and Industry has authorised the formation of a company, with the title Kalij a.d., to engage in the importation and sale of fertilisers, principally potash, and the encouragement of the use of such fertilisers in Yugoslavia. Both German and French capital is understood to be interested in the company.

THE REPLACEMENT of petroleum products by compressed gases in the propulsion of automotive vehicles is proceeding apace in many Italian cities. Omnibuses in Naples are now running on coal gas which is freed from naphthalene and sulphur and compressed in cylinders to 200 atmospheres. Methane has been largely adopted in Milan to which city it is transported from an outlying works under 150 atmospheres pressure. Milan is also experimenting with the production of methane from sewage sludge.

IN THE course of an investigation into the efficacy of a number of absorbent masses in respect of war gases, M. Sartori (*La Chimica e L'Industria*, September, 1939) compared the protection afforded against diphenyl chlorarsine by the following types of gas mask filtering masses: compressed cellulose fibre, loose cellulose fibre, carded and compressed wool and felted wool. These tests showed that carded and compressed wool continued to absorb diphenyl chlorarsine for 70 minutes and was slightly superior in this respect to compressed cellulose and felted wool, while loose cellulose was entirely non-absorbent.

THE SHORTAGE of raw materials in Norway has led to the revival of a number of previously rejected schemes for the production of national substitutes for certain imported raw materials and semi-manufactured goods. Among the schemes discussed seriously is one for the production of synthetic rubber from calcium carbide, a product produced in large quantities by the Norwegian electro-chemical industry. Up to now, the carbide has been largely exported, *inter alia*, to Germany, but, with the advent of the blockade, the idea of using the materials for synthetic rubber production has seemed both feasible and economic.

THE MECHANISM of the formation of zinc chromates by treatment of zinc oxide with acids and potassium bichromate has been studied by I. Riskin (*J. Prikl. Khim.*, 1939, 5, 686). On reacting zinc oxide with sulphuric acid, part of the zinc is precipitated as the basic salt $4\text{Zn(OH)}_2 \cdot \text{ZnSO}_4$ while part goes into solution as zinc sulphate. The insoluble portion after treatment with hydrochloric acid is $4\text{Zn(OH)}_2 \cdot \text{ZnCl}_2 \cdot \text{H}_2\text{O}$. Chromates of varying composition are formed on adding potassium bichromate to acid-treated zinc oxide and can be represented by the general formula $4\text{ZnO} \cdot \text{CrO}_3 \cdot \frac{x}{2} \text{K}_2\text{O} \cdot 3\text{H}_2\text{O}$, where x ranges from 1 to 4 and a is equal to 4 in the case of a technically satisfactory zinc chromate.

ACCORDING TO A REPORT from the American Consulate General at Frankfurt-on-Main, total sales of ammonium sulphate by the German Nitrogen Syndicate in 1937-38 increased by about 41,000 metric tons to 237,200 metric tons. Ammonium sulphate represented 28.3 per cent. of the total sales, both domestic and foreign, of all types of nitrogenous fertiliser, an increase of 2.3 per cent. over 1936-37. In the domestic trade ammonium sulphate accounted for 24.4 per cent., and in the foreign trade 39.3 per cent. of the combined trade in nitrogenous fertiliser. Despite this favourable sales showing, measures were undertaken for determining the possibilities for processing coke-oven nitrogen to fertiliser free of sulphuric acid. After showing a remarkable gain in the calendar year 1937, exports of nitrogenous fertilisers decreased considerably in 1938, and the downward trend was considerably accelerated in the first five months of 1939.

NEW CONTROL ORDERS

Oilseeds, Fats, Marine Oils and Dyestuffs

THE Oilseeds, Vegetable Oils and Fats and Marine Oils (Control) Order, dated October 4, 1939, issued by the Minister of Food, came into force on October 8, 1939, in pursuance of Regulations 53 and 55 of the Defence Regulations, 1939. This order lays down regulations concerning the disposals of oilseeds, oils and fats detailed in the schedules below. Every person having power to dispose of more than 5 tons gross weight of the specified oils, etc., which shall arrive in the United Kingdom after the coming into force of this Order is required to place these at the disposal of the Minister. This provision applies also to similar quantities of the materials concerned which were in the U.K. at the time of the coming into force of the Order, unless these were in the possession of a trade consumer. Further provisions prohibit the buying and selling, except under licence granted by the Minister, of any of the specified oils, etc., situate outside the U.K., and direct the provision to the Minister of returns showing the quantities of the materials concerned at disposal, and the keeping of records as to dealings with them in readiness for inspection on behalf of the Minister.

The schedules of materials affected are as follows:—

OILSEEDS.

Castor Seed.	Kapok Seed.
Copra.	Linseed.
Cotton Seed.	Niger Seed.
Gingelly (Sesame Seed).	Palm Kernels.
Ground Nuts (Uncorticated).	Rape Seed.
Ground Nuts (Decorticated).	Shea Nuts.
Illipe Nuts.	Soya Beans.

VEGETABLE OILS AND FATS.

Castor Oil.	Niger Seed Oil.
Coconut Oil.	Olive Oil.

Cotton Seed Oil.	Palm Oil.
Gingelly (Sesame) Oil.	Palm Kernel Oil.
Ground Nut Oil.	Perilla Seed Oil.
Illipe Oil.	Rape Seed Oil.
Kapok Seed Oil.	Shea Butter or Oil.
Linseed Oil.	Soya Bean Oil.
Maize Oil.	

Any mixtures of any of the above oils and fats.

MARINE OILS.

Herring Oil.	Sperm Oil.
Pilchard Oil.	Whale Oil.
Seal Oil.	

Any mixtures of any of the above oils.

Dyestuffs

Under the Control of Dyestuffs Order, 1939, which came into force on October 13, the sale or supply of dyestuffs or intermediates which are not goods wholly or partly manufactured in the United Kingdom is prohibited except under the authority of a licence granted by the Board of Trade. Any person carrying on the business of selling or supplying the dyestuffs or intermediates affected by the Order must furnish to the Board of Trade such returns or other information as may be required by the Board of Trade.

The schedule of goods affected by the Order is as follows:—Synthetic organic dyestuffs (including pigment dyestuffs), whether soluble or insoluble; compounds, preparations and articles manufactured from any such dyestuffs, except any such compounds, preparations and articles as are not suitable for use in dyeing; organic intermediate products used in the manufacture of any such dyestuffs.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

CHEMICAL PROCESSES AND COMPOSITIONS.—Du Pont Film Manufacturing Corporation. (United States, Sept. 26, '38.) 26104.

SIMULTANEOUS PRODUCTION OF MAGNESIUM and low carbon ferro-alloys.—Electrometal Soc. Anon. (Luxemburg, Oct. 21, '38.) 26122.

PROCESS FOR PROTECTION OF MAGNESIUM and its alloys.—J. Frasch. (France, Sept. 22, '38.) 26169.

SILICEOUS MATERIALS.—N. S. Garbisch. (United States, April 14, '38.) 26215.

MANUFACTURE OF CERAMIC WARE.—N. S. Garbisch. (United States, Dec. 16, '38.) 26216.

MANUFACTURE OF GLAZED CERAMIC BODIES.—N. S. Garbisch. (United States, Nov. 29, '38.) 26217.

PROCESS OF AND APPARATUS FOR FORMING CERAMIC BODIES.—N. S. Garbisch. (United States, Dec. 16, '38.) 26220.

OIL FILTERS.—General Motors Corporation. (United States, Oct. 5, '38.) 25920.

PREPARATION OF COMPOUNDS OF MORPHOLINE.—Harris-Seybold-Potter Co. (United States, April 29, '38.) 26202.

MANUFACTURE OF DICHLOROETHYLENE.—W. N. Howell and Imperial Chemical Industries, Ltd. 25796.

MANUFACTURE OF POLYMERIC MATERIALS.—Imperial Chemical Industries, Ltd. (United States, Sept. 19, '38.) 26030, 26031.

PEST CONTROL COMPOSITIONS.—Imperial Chemical Industries, Ltd. (Du Pont de Nemours and Co.). 26032.

METHODS OF MAKING RUBBER COATED CONDUCTORS.—International Latex Processes, Ltd. (United States, Sept. 22, '38.) 25908.

DIVIDING OF SEMI-SOLID PLASTIC MATERIALS.—Internationella Siporex Aktiebolag. (Sweden, Oct. 18, '38.) 25809.

MANUFACTURE OF OXIDATION PRODUCTS.—F. W. Kirkbride, and Imperial Chemical Industries, Ltd. 25792, 25793.

Specifications Accepted with Date of Application

INSULIN PREPARATIONS.—E. Lilly and Co., and G. B. Walden. Dec. 1, 1937. 512,415.

BENZENESULPHONALKANOLAMIDE DERIVATIVES, and process of producing them.—E. Lilly and Co. Jan. 23, 1937. 512,460.

PRODUCTION OF SEED DISINFECTANTS.—G. Six, J. R. Boer, and Leyton Manufacturing Co., Ltd. March 7, 1938. 512,490.

PRODUCTION OF ORGANIC PIGMENTS.—Tootal Broadhurst Lee Co., Ltd., R. P. Foulds and R. N. Johnson. Dec. 9, 1937. 512,607.

MANUFACTURE OF UREA-ALDEHYDE CONDENSATION PRODUCTS.—British Industrial Plastics, Ltd., and A. Brookes. Dec. 13, 1937. 512,659.

MANUFACTURE OF DYESTUFFS OF THE ANTHRAQUINONE SERIES.—A. G. Bloxam. Dec. 22, 1937. 512,512.

METHOD OF PRODUCING THERMOPLASTIC DIE CASTINGS.—L. H. Morin and D. Marinsky. (March 18, 1937.) 512,714.

PREPARATION OF DIAZO DYESTUFFS.—Chemical Works, formerly Sandez. (March 8, 1937.) 512,618.

MANUFACTURE OF DITHIOHYDANTOINS.—H. C. Carrington and Imperial Chemical Industries, Ltd. March 8, 1938. 512,629.

STROPHANTHUS GLUCOSIDE, AND PROCESS FOR ITS MANUFACTURE.—Chemical Works, formerly Sandez. (Oct. 20, 1937.) 512,526.

INSECTICIDAL COMPOSITIONS.—B. Collie, R. Hill, W. A. Sexton and Imperial Chemical Industries, Ltd. March 11, 1938. 512,691.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (March 15, 1937.) (Cognate Application, 8004/38.) 512,579.

MANUFACTURE OF VAT DYESTUFFS OF THE ANTHRAQUINONE SERIES.—W. W. Groves (I. G. Farbenindustrie). March 15, 1938. (Addition to 480,749.) 512,580.

PREPARATION OF SALTS OF HEXAMETHYLENETETRAMINE.—E. T. Tisza. March 18, 1938. 512,583.

MANUFACTURE AND PRODUCTION OF INTERPOLYMERISATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie). March 18, 1938. 512,703.

ARTICLES OF ALUMINIUM OR ALUMINIUM ALLOYS.—Ferranti, Ltd., G. I. Finch, J. Dawson and T. L. Houghton. July 8, 1938. 512,538.

LABORATORY PLATINUM CRUCIBLES, AND METHOD OF PRODUCING SAME.—J. S. Streicher and American Platinum Works. Dec. 8, 1938. 512,742.

Weekly Prices of British Chemical Products

THERE are no important price alterations to note in the general chemical market this week, and values, apart from those for imported materials, have a steady appearance. Reports from most departments indicate that the markets are consistently active and that a fair amount of new spot business is being put through. There is still a very limited supply of the potash salts available, and small parcels of caustic and carbonate are being offered at high prices. Although there is quite a good demand for oxalic acid supplies are somewhat restricted. A fairly wide demand is maintained for the coal tar products and values are inclined to higher levels.

MANCHESTER.—Steady to firm price conditions remain an outstanding feature of chemical and allied products on the Manchester market. Activity in the cotton and woollen textile trades in Lancashire and the West Yorkshire districts has made for a steady demand for a wide range of heavy chemicals, whilst fair quantities are moving into consumption in several other of the

using trades, chiefly against contracts. Potash materials remain a nominal market and spot offers are scarce. Among the by-products the rise in the price of petrol this week has had a further stiffening influence on values in several instances. Buying interest in most of the light tar products is on an active scale.

Price Changes*

Rises: Charcoal, Citric Acid, Iodine, Lead Acetate, Caustic Potash, Potassium Iodide, Salt Cake, Sodium Phosphate, Sodium Prussiate, Tartaric Acid, Benzol. **MANCHESTER:** Citric Acid, Tartaric Acid, Benzol, Creosote.

*In the case of certain products, here marked with an asterisk, the market is still nominal and the last ascertainable prices have been included.

General Chemicals

ACETIC ACID.—Maximum prices per ton: 40% technical, 1 ton or over, £15 12s.; 10 cwt. and less than 1 ton, £16 12s.; 4 cwt. and less than 10 cwt., £17 12s.; 80% technical, 1 ton, £29 5s.; 10 cwt./1 ton, £30 5s.; 4/10 cwt., £31 5s.; 80% pure, 1 ton, £31 5s.; 10 cwt./1 ton, £32 5s.; 4/10 cwt., £33 5s.; commercial glacial, 1 ton, £37; 10 cwt./1 ton £38; 4/10 cwt., £29; delivered buyers' premises in returnable barrels.

ACETONE.—Maximum prices per ton, 50 tons and over, £39; 10/50 tons, £39 10s.; 5/10 tons, £40; 1/5 tons, £40 10s.; single drums, £41 10s., delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

***ALUM.**—Loose lump, £8 7s. 6d. per ton d/d; **GLASGOW:** Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

***ALUMINIUM SULPHATE.**—£7 5s. 0d. per ton d/d Lanes.

AMMONIA, ANHYDROUS.—99.95%, 1s. to 2s. per lb. according to quantity in loaded cylinders, carriage paid; less for important contracts.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising £21 per ton, in casks, ex wharf. See also Salammoniace.

AMMONIUM DICHROMATE.—1s. per lb. d/d U.K.

***ANTIMONY OXIDE.**—£68 per ton.

ARSENIC.—Prices nominal, f.o.b. Antwerp, subject to works acceptance.

BARIUM CHLORIDE.—Market nominal. **GLASGOW:** £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. **GLASGOW:** £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £18 per ton; crystal, £19; powdered, £19 10s.; extra finely powdered, £20 10s.; B.P. crystals, £27; powdered, £27 10s.; extra fine, £28 10s. per ton, in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £60; powder, £61; in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

BORIC ACID.—Commercial granulated, £32 per ton; crystal, £33; powdered, £34; extra finely powdered, £36; large flakes, £44 10s.; B.P. crystals, £41; powdered, £42; extra fine powdered, £44 per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain.

CALCIUM BISULPHITE.—£7 5s. per ton f.o.r. London.

***CALCIUM CHLORIDE.**—**GLASGOW:** 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL LUMP.—£7 5s. to £11 per ton, ex wharf. Granulated £7 to £9 per ton according to grade and locality.

***CHLORINE, LIQUID.**—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

***CHROMETAN.**—Crystals, 3d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—10½d. per lb., less 2½% d/d U.K.

***CHROMIC OXIDE.**—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 1d. per lb. **MANCHESTER:** 1s. 1½d.

***COPPER SULPHATE.**—£18 5s. per ton, less 2% in bags. **MANCHESTER:** £23 per ton f.o.b. **GLASGOW:** £19 10s. per ton, less 5%, **Liverpool** in casks.

***CREAM OF TARTAR.**—100%, £4 12s. per cwt., less 2½%. **GLASGOW:** 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—40% by volume, £25 to £27 per ton, according to quantity, in casks, ex store.

FORMIC ACID.—85%, £42 per ton for ton lots, ex store, in cylinders; smaller parcels quoted at 45s. 6d. to 47s. 6d. per cwt., ex store.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HENAMINE.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7d. per lb.; carriage paid for bulk lots.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 11s. 2d. per lb. in 7 lb. lots.

***LACTIC ACID.**—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £23; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—**LONDON:** White, £48 to £50, ton lots. **MANCHESTER:** Market nominal. **GLASGOW:** Market nominal.

LEAD NITRATE.—About £40 per ton in casks.

LEAD, RED.—English, 5/10 cwt., £35; 10 cwt. to 1 ton, £34 15s.; 1/2 tons, £34 10s.; 2/5 tons, £34; 5/20 tons, £33 10s.; 20/100 tons, £33; over 100 tons, £32 10s. per ton, less 2½ per cent. carriage paid; non-setting red lead, 10s. per ton dearer in each case; Continental material, £1 per ton cheaper.

LEAD, WHITE.—Dry English, less than 5 tons, £45; 5/15 tons, £41; 15/25 tons, £40 10s.; 25/50 tons, £40; 50/200 tons, £39 10s. per ton, less 5% carriage paid; Continental material £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £53; 5/10 cwt., £52; 10 cwt. to 1 ton, £51 10s.; 1/2 tons, £50; 2/5 tons, £49; 5/10 tons, £47; 10/15 tons, £46; 15/25 tons, £45 10s.; 25/50 tons, £45; 50/100 tons, £44 10s. per ton, less 5% carriage paid. Continental material £2 per ton cheaper.

LITHARGE.—10 cwt.-1 ton, £34 15s. per ton.

LITHOPONE.—Maximum prices, 28/30 per cent., £15 10s. per ton, 60 per cent., £29 per ton, delivered buyers' premises.

MAGNESITE.—Calcined, in bags, ex works, about £9 to £10 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf), £10 per ton.

***MAGNESIUM SULPHATE.**—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Controlled prices for 1 cwt. quantities: Bichloride powder, 6s. 4d.; bichloride (industrial users), 6s. 4d.; bichloride lump, 6s. 11d.; bichloride ammon. powder, 7s. 10d.; bichloride ammon. lump, 7s. 8d.; mercurous chloride, 7s. 8d.; mercury oxide, red cryst., B.P., 9s.; red levig. B.P., 8s. 6d.; yellow levig. B.P., 8s. 4d.

***METHYLATED SPIRIT.**—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

***NITRIC ACID.**—Spot, £25 to £30 per ton, according to strength, quantity and destination.

OXALIC ACID.—£48 5s. per ton for ton lots, ex wharf, in casks, smaller parcels, 53s. to 57s. per cwt., ex store; deliveries slow.

***PARAFFIN WAX.**—**GLASGOW:** 3½d. per lb.

POTASH, CAUSTIC.—Market nominal. **MANCHESTER:** £47 per ton.

POTASSIUM CHLORATE.—Imported powder and crystals, ex store **LONDON:** 10d. to 1s. per lb.

***POTASSIUM DICHROMATE.**—5½d. per lb. carriage paid. **GLASGOW:** 5½d. per lb., net, carriage paid.

POTASSIUM CHROMATE.—2s. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 9s. 10½d. per lb. in 7 lb. lots; for not less than 1 cwt., 7s. 9d. per lb.
 POTASSIUM NITRATE.—Small granular crystals, £26 to £29 per ton ex store, according to quantity.
 POTASSIUM PERMANGANATE.—Commercial, about 10½d. per lb., delivered.
 POTASSIUM PRUSSIAN.—Yellow, market nominal, supplies scarce.
 SALAMMONIAC.—Dog-tooth crystals, £40 per ton; medium, £39; fine white crystals, £20; in casks, ex store.
 SALT CAKE.—Unground, spot, £3 15s. per ton.
 SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.
 SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.
 SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
 SODIUM ACETATE.—£25 to £26 per ton, ex wharf.
 SODIUM BICARBONATE.—About £10 10s. per ton, in bags.
 SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.
 SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
 SODIUM CHLORATE.—£27 10s. to £32 per ton, d/d according to quantity.
 *SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb net d/d U.K. with rebates for contracts. GLASGOW: 4½d. per lb., carriage paid.
 *SODIUM CHROMATE.—5d. per lb. d/d U.K.
 SODIUM HYPOSULPHITE.—Pea crystals, £15 15s. per ton for 2-ton lots; commercial, £11 15s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
 *SODIUM METASULFATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
 SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d GLASGOW: £1 12s. per cwt. in 1-cwt. kegs, net, ex store.
 SODIUM NITRITE.—£18 5s. per ton for ton lots.
 SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.
 SODIUM PHOSPHATE.—Di-sodium, £16 to £17 per ton delivered for ton lots. Tri-sodium, £18 10s. per ton delivered per ton lots.
 SODIUM PRUSSIAN.—4½d. to 5½d. per lb.
 SODIUM SILICATE.—£8 2s. 6d. per ton.
 *SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
 *SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 15s.
 SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
 *SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
 *SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
 SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
 TARTARIC ACID.—1s. 2d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 2d. per lb.
 ZINC OXIDE.—Maximum prices: White seal, £23 10s. per ton; red seal, £19 10s.; green seal, £22 10s. d/d buyers' premises.
 *ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2-cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 8d. to 1s. 4d. per lb., according to quality. Crimson, 1s. 8½d. to 1s. 9½d. per lb.
 ARSENIC SULPHIDE.—Yellow, 1s. 6d. to 1s. 8d. per lb.
 CARBON DISULPHIDE.—£38 to £41 per ton, according to quantity, drums extra.
 CARBON TETRACHLORIDE.—£48 to £53 per ton, according to quantity, drums extra.
 CHROMIUM OXIDE.—Green, 1s. 3d. per lb.
 INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark 3½d. to 4½d. per lb.
 SULPHUR CHLORIDE.—6d. to 8½d. per lb., according to quantity.
 VEGETABLE BLACK.—£35 per ton upwards; 28/30%, £15 10s. 0d.; 60%, £29, delivered buyers' premises.
 ZINC SULPHIDE.—£56 per ton ex works.
 Plus 5% War Charge.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1940: September, £7 5s.; October, £7 6s. 6d.; November, £7 8s.; December, £7 9s. 6d.; January, 1940, £7 11s., February £7 12s. 6d.; March/June, £7 14s.
 CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1940: September £8 2s. 6d.; October £8 3s. 9d.; November £8 5s.; December, £8 6s. 3d.; January, 1940, £8 7s. 6d.; February £8 8s. 9d.; March £8 10s.; April/June, £8 11s. 3d.
 NITRO-CHALK.—£7 10s. 6d. per ton up to June 30, 1940.
 SODIUM NITRATE.—£8 5s. per ton for delivery up to June 30, 1940.
 CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, about 1s. 0½d. per gal.; standard motor, 1s. 6½d. to 1s. 7d.; 90%, 1s. 7½d. to 1s. 8d., pure 1s. 8½d. to 1s. 9d. MANCHESTER: Crude, 1s. 0½d. to 1s. 1d. per gal.; pure, 1s. 8½d. to 1s. 9d. per gal.; motor grade 1s. 7d. CARBOLIC ACID.—Crystals, 9d. per lb.; Crude, 60's, 3s. to 3s. 3d. according to specification. MANCHESTER: Crystals, 8½d. to 9d. per lb., d/d.
 CREOSOTE.—Home trade, from 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 4d. to 5½d.
 CRESYLIC ACID.—98/100%, 2s. 9d. to 3s. per gal., according to specification. MANCHESTER: Pale, 99/100%, 2s. 10d.
 NAPHTHA.—Solvent, 90/160°, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160°, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190°, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160° 1s. 6d. to 1s. 8d. per gal.
 NAPHTHALENE.—Crude, whizzed or hot pressed, £6 to £6 10s. per ton; purified crystals, £9 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £17.
 PITCH.—Medium, soft, 35s. per ton, f.o.b. MANCHESTER: 27s. 6d. f.o.b. East Coast.
 PYRIDINE.—90/140%, 17s. 6d. per gal.; 90/160%, 15s.; 90/180%, 3s. to 4s. per gal. f.o.b. MANCHESTER: 13s. 6d. to 17s. per gallon.
 TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; pure, 2s. 6d. to 2s. 7d. MANCHESTER: Pure, 2s. 7d. per gallon, naked.
 XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. MANCHESTER: 2s. 6d. per gallon.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £8 per ton; grey, £9 to £11. MANCHESTER: Grey, £14.
 METHYL ACETONE.—40.50%, £35 to £38 per ton.
 WOOD CREOSOTE.—Unrefined, 8d. to 1s. per gal., according to boiling range.
 WOOD NAPHTHA, MISCIBLE.—3s. 3d. to 3s. 8d. per gal.; solvent, 3s. 4d. to 3s. 9d. per gal.
 WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
 ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
 BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.
 BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
 BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.
 m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
 o-CRESOL 30/31° C.—6½d. per lb. in 1-ton lots.
 p-CRESOL 34/35° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
 DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
 DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
 DINITROBENZENE.—7½d. per lb.
 DINITROCHLOROBENZENE, SOLID.—£79 5s. per ton.
 DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.
 DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.
 GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.
 H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.
 NAPHTHIONIC ACID.—1s. 10d. per lb.
 β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
 α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
 β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
 NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
 o-NITRANILINE.—4s. 3½d. per lb.
 m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
 p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's w. rks.
 NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
 NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.
 SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
 SULPHANILIC ACID.—Spot, 8½d. per lb. 100%, d/d buyer's works.
 o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.
 p-TOLUIDINE.—1s. 10½d. per lb., in casks.
 m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON.—Oct. 17.—Prices for controlled material allocated to trade consumers for the period to October 28 remain unchanged. Non-controlled commodities were in fair request. In rosin a few small lots were available at 30s. to 35s. per cwt., according to grade and supply. In turpentine there were rather cheaper sellers at 70s. per cwt., spot, American, including tax, ex wharf, barrels, and ex discount.
 HULL.—Oct. 18.—Oils were being allocated at the prices agreed upon on October 7.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CROSS OF ENFIELD, LTD., chemists. (M., 21/10/39.) Oct. 7, charge and a debenture collateral thereto securing £1,000 and all other moneys, etc., to A. L. Underwood, London; charged on 4 The Broadway, Mill Hill, etc., and a general charge. *Nil. March 1, 1939.

J. HOLROYD AND CO., LTD., Huddersfield, textile dyers. (M., 21/10/39.) Oct. 9, £650 debenture stock, part of amount already registered; also Oct. 9, charge, to Union Bank of Manchester, Ltd., securing all moneys due or to become due to the Bank; charged on 110 Victoria Street, Great Grimsby, etc. *£26,771. Aug. 19, 1939.

THAMES OIL WHARF CO., LTD., London, E.C. (M., 21/10/39.) Oct. 5, series of £1,000 (not ex.) debentures, present issue £800; general charge. *£9,495. Dec. 22, 1938.

W. BURTON AND SONS, LTD., Leicester, bleachers and dyers. (M., 21/10/39.) Oct. 11, charge and a mortgage, to Barclays Bank, Ltd., each securing all moneys due or to become due to the Bank; charged on lands and buildings, at Western Road and Gaul Street, Leicester (subject, etc.) and 4, 6 and 10 Wilberforce Road, Leicester. *£7,000. June 15, 1938.

BRITISH ALUMINIUM CO., LTD., Shrewsbury. (M., 14/10/39.) September 26, disposition by Wm. Young, junr., with consent of the company granted in implement of a Trust Deed dated September 12, 1934, to secure an issue of £3,500,000 debenture stock; charged on part of the lands and estate of Craigenalt, Kinghorn. *£3,465,687. April 11, 1939.

Satisfactions

CASCALOID, LTD., Leicester, celluloid manufacturers, etc. (M.S., 21/10/39.) Satisfactions Oct. 6, of charges registered March 31, 1932, May 8, 1935, and June 27, 1938.

REVOL, LTD., Newcastle-on-Tyne, oil merchants. (M.S., 21/10/39.) Satisfaction Oct. 5, of debentures registered Nov. 15, 1934.

Chemical and Allied Stocks and Shares

CHEERFUL and slightly more active conditions have ruled in the stock and share markets, where the further rise in gilt-edged stocks and encouraging reports from centres of the heavy industries were the main factors dominating the general trend. The majority of shares of chemical and associated companies reflected the upward movement, but, as in most other directions, the rise in prices was probably out of proportion to the demand. There is still not a great deal of business passing on the Stock Exchange, and consequently moderate buying or selling may have a disproportionate influence on quotations for individual securities.

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Imperial Smelting were firm prior to the annual meeting, and at 10s. 9d. were 9d. higher on balance, while Imperial Chemical improved from 28s. 1½d. to 29s. 3d. The preference units of the last-named company were 28s. 3d., and Lever and Unilever preference units also moved moderately in favour of holders, largely as a result of the better tendency in fixed-interest bearing securities, which has been governed by the firmness of gilt-edged stocks. Following news of the raising of the interim dividend from 5 per cent. to 6½ per cent. United Premier Oil and Cake rallied to 7s. 6d., which compares with 6s. 10½d. a week ago. British Oil and Cake Mills preferred were 36s. 3d. compared with 32s. 6d. a week ago. Burt Boulton and Haywood continued to be quoted at 17s. 6d. "middle" following the dividend announcement, while Fison Packard were 35s. 6d., but remained inactive awaiting the results for the past year's working.

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Distillers moved up from 85s. 6d. to 90s. 6d., Pinchin Johnson from 18s. to 21s., and United Molasses from 25s. to 26s., while Turner and Newall, Associated Cement and British Oxygen were other shares which moved in favour of holders. Nevertheless, best prices touched this week were not fully held. Among smaller-priced securities Low Temperature Carbonisation were 1s. 10½d.,

Companies Winding-Up Voluntarily

OIL WHARVES, LTD. (C.W.U.V., 21/10/39.) General meeting of members will be held at the office of Messrs. Reynolds, Adams and Lake, 24-26 Basinghall Street, London, E.C.2, on Tuesday, November 14, 1939, at 3 p.m. Ralph E. Reynolds, liquidator.

J. W. SIMPSON (CHEMIST), LTD. (C.W.U.V., 14/10/39.) Mr. H. R. Crombie, of Aldwych House, Aldwych, London, W.C.2, appointed liquidator.

Release of Liquidator

THE NATIONAL CHEMICAL HOLDINGS, LIMITED. (R.O.L., 14/10/39.) Hugh Parker Naunton, Official Receiver and Liquidator, 33 Carey Street, Lincoln's Inn, London, W.C.2. Date of Release, September 22, 1939.

Receivers Ceasing to Act

BLOOMDALE CHINA CLAY CO., LTD., London, E.C. (R.C.T.A., 14/10/39.) J. W. Shaffery. Oct. 3.

Company News

The United Premier Oil and Cake Co., Ltd., have declared an interim dividend of 6½ per cent. (or 4d. per share), less tax, on the ordinary shares payable on November 1 next.

Lightalloys, Ltd., have declared a final dividend of 20 per cent., less tax at 7s., making, with the interim of 5 per cent., a total of 35 per cent. Payment will be made on November 1.

Erinoid, Ltd., plastics manufacturers, report a fall in trading profits from £23,534 to £15,368. Depreciation takes £6,703 (£6,690), directors' fees £1,777 (£1,839), leaving £5,910 compared with £14,605. After providing £4,113, against £4,210, for tax reserve, writing off £3,206 from expenditure on development of new processes and paying a full year's preference dividend, the carry-forward is reduced from £8,821 to £5,020.

Murex, Ltd., report in the accounts for the year ended June 30 last a decrease in earnings from trading profits from £346,657 to £267,562. Dividends received amount to £71,673, against £76,984, and total income is £344,519, compared with £429,855. Tax and N.D.C. takes £2,950 less at £108,500, and obsolescence reserve £3,074 less at £50,000. After providing for office expenses, fees, etc., net profits are reduced from £257,698 to £178,829, compared with 1937-38. General reserve receives £10,000, against £100,000. The carry-forward is £90,167, compared with £90,464 last year.

New Companies Registered

Fluid Transfer, Ltd. (325,496.)—Mechanical, electrical and chemical engineers, etc., 121 Victoria Street, S.W.1.—The nominal capital has been increased by the addition of £7,500, beyond the registered capital of £2,750. The additional capital is divided into 7,500 6 per cent. non-cumulative preference shares of £1.

while Erinoid were slightly better at 2s. 6d., the strong balance-sheet of the last-named company having tended to offset disappointment with the decline in earnings shown by the results. Borax Consolidated were in some request, and on balance for the week have moved up from 23s. 9d. to 26s. 3d. Swedish Match remained at 15s. 7½d., but British Match at 31s. 6d. were 9d. better. B. Laporte were inactive and were again around 56s. 3d. William Blythe were quoted at the better price of 6s., at which these shares, which are of 3s. denomination, offer a yield of 5 per cent. This is not large when compared with the yields on many industrial shares, but the company has always distributed its profits conservatively, and last year earnings were well in excess of the 10 per cent. dividend. Newton Chambers were quoted at 40s. 6d. at Sheffield.

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Iron and steel securities reflected the better market tendency, and improved prices were shown by Dorman Long, Guest Keen, Staveley and Stewarts and Lloyds, while Babcock and Wilcox improved to close on 40s. Dunlop Rubber were higher at 27s. 6d., but Triplex Glass at 22s. 6d. were relatively dull because it is realised that demand for the company's main product is bound up with conditions prevailing in the motor trade. Courtaulds and various rayon shares attracted somewhat more attention, while moderate gains were shown by Bleachers, Bradford Dyers and other textile securities. Elsewhere Murex were firm at 78s. 9d. on the statements at the meeting, and General Refractories made the better price of 8s. Boots Drug were firmer at 40s. 6d., while Sangers were 20s., and Timothy Whites 21s.

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Oil shares showed a fairly general advance and Anglo-Iranian were 61s. 3d. compared with 58s. 1½d. a week ago, while "Shell" moved up from 83s. 9d. to 86s. 3d. and Trinidad Leaseholds from 97s. 6d. to 100s.

